



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p><b>(51) International Patent Classification <sup>5</sup> :</b>  <b>G06F 3/023, G09B 21/00</b>  <b>B41J 5/10</b></p>	<b>A1</b>	<p><b>(11) International Publication Number:</b> <b>WO 91/03782</b></p> <p><b>(43) International Publication Date:</b> 21 March 1991 (21.03.91)</p>																																																																					
<div style="display: flex; justify-content: space-between;"> <div style="width: 50%;"> <p><b>(21) International Application Number:</b> PCT/CA90/00274</p> <p><b>(22) International Filing Date:</b> 29 August 1990 (29.08.90)</p> <p><b>(30) Priority data:</b>  609,678                      29 August 1989 (29.08.89)                      CA</p> <p><b>(71)(72) Applicant and Inventor:</b> MATIAS, Edgar [CA/CA]; 178  Thistledown Blvd., Rexdale, Ontario M9V 1K1 (CA).</p> <p><b>(74) Agent:</b> SIM &amp; McBURNEY; 330 University Ave., Suite  701, Toronto, Ontario M5G 1R7 (CA).</p> <p><b>(81) Designated States:</b> AT, AT (European patent), AU, BB, BE  (European patent), BF (OAPI patent), BG, BJ (OAPI pa-  tent), BR, CA, CF (OAPI patent), CG (OAPI patent),  CH, CH (European patent), CM (OAPI patent), DE*,  DE (European patent)*, DK, DK (European patent), ES,  ES (European patent), FI, FR (European patent), GA  (OAPI patent), GB, GB (European patent), HU, IT (Eu-  ropean patent), JP, KP, KR, LK, LU, LU (European pa-  tent), MC, MG, ML (OAPI patent), MR (OAPI patent),  MW, NL, NL (European patent), NO, RO, SD, SE, SE  (European patent), SN (OAPI patent), SU, TD (OAPI  patent), TG (OAPI patent), US.</p> </div> <div style="width: 45%; text-align: center;"> <p><b>Published</b>  <i>With international search report.</i></p> </div> </div>																																																																							
<p><b>(54) Title:</b> ONE-HANDED KEYBOARD</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 5px;">Tab</td> <td style="padding: 5px;">~   \ 5</td> <td style="padding: 5px;">^ 6</td> <td style="padding: 5px;">\$ 4</td> <td style="padding: 5px;">&amp; 7</td> <td style="padding: 5px;"># 3</td> <td style="padding: 5px;">* 8</td> <td style="padding: 5px;">• 2</td> <td style="padding: 5px;">(  9</td> <td style="padding: 5px;">   1</td> <td style="padding: 5px;">)  0</td> <td style="padding: 5px;">Up =</td> <td style="padding: 5px;">+ =</td> <td style="padding: 5px;">Back- space</td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">T</td> <td style="padding: 5px;">Y</td> <td style="padding: 5px;">R</td> <td style="padding: 5px;">U</td> <td style="padding: 5px;">E</td> <td style="padding: 5px;">I</td> <td style="padding: 5px;">W</td> <td style="padding: 5px;">O</td> <td style="padding: 5px;">Q</td> <td style="padding: 5px;">P</td> <td style="padding: 5px;">Left { [</td> <td style="padding: 5px;">Right } ]</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Caps Lock</td> <td style="padding: 5px;">G</td> <td style="padding: 5px;">H</td> <td style="padding: 5px;">F</td> <td style="padding: 5px;">J</td> <td style="padding: 5px;">D</td> <td style="padding: 5px;">K</td> <td style="padding: 5px;">S</td> <td style="padding: 5px;">L</td> <td style="padding: 5px;">A</td> <td style="padding: 5px;">: Down ;</td> <td style="padding: 5px;">Return</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Shift</td> <td style="padding: 5px;">B</td> <td style="padding: 5px;">N</td> <td style="padding: 5px;">V</td> <td style="padding: 5px;">M</td> <td style="padding: 5px;">C</td> <td style="padding: 5px;">&lt; ,</td> <td style="padding: 5px;">Z .</td> <td style="padding: 5px;">&gt; .</td> <td style="padding: 5px;">Z /</td> <td style="padding: 5px;">?</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;"></td> <td colspan="12" style="padding: 5px; text-align: right;">rHq</td> </tr> </table>			Tab	~   \ 5	^ 6	\$ 4	& 7	# 3	* 8	• 2	( 9	 1	) 0	Up =	+ =	Back- space		T	Y	R	U	E	I	W	O	Q	P	Left { [	Right } ]		Caps Lock	G	H	F	J	D	K	S	L	A	: Down ;	Return			Shift	B	N	V	M	C	< ,	Z .	> .	Z /	?					rHq											
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<p><b>(57) Abstract</b></p> <p>A one-handed keyboard comprising a plurality of keys representing one half of a standard keyboard, apparatus for assign-  ing a pair of characters to each key of the plurality of keys, one of the characters being normally associated with the key in a  standard keyboard and the other character being associated with a symmetrically opposite key of the other half of the standard  keyboard. A modifier key is provided for controlling the aforementioned apparatus to switch between the one half and the other  half of the keyboard, whereby one-handed operation of the keyboard is provided using standard touch-typing techniques for  standard keyboard design.</p>																																																																							

### DESIGNATIONS OF "DE"

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ONE HANDED-KEYBOARDTechnical Field

This invention relates to keyboards, and more particularly to a keyboard adapted for one-handed  
5 operation.

Background of the Invention

The most popular English language keyboard in use today is the QWERTY design developed in 1872 by C.L. Sholes, which has become a worldwide standard. A typist  
10 rests his or her fingers on the home-rows keys (i.e. the fingers of the left on the letters A S D F, and the fingers of the right hand on J K L). The left hand governs operation of the left half of the keyboard while the right hand governs operation of the right half. All  
15 of the other keys are struck according to their position relative to the home-row keys.

For example, the keys for 3 and E are above the D key, while the C key is below. Therefore, these four keys may all be struck by the same finger of the left  
20 hand (i.e. the finger that usually rests on the D key).

A "shift" key is also normally provided for remapping the keyboard to attain capitals on the letter keys and various symbols on the non-letter keys.

A disadvantage of traditional two-handed QWERTY  
25 design is that the keyboard is quite large, and the keys must be angularly offset to accommodate both arms of a typist being separated by his or her rib cage.

Many prior art attempts have been made at developing a one-handed keyboard, for overcoming the disadvantages  
30 of traditional QWERTY layouts. For example, United States Patent 4,555,193 (Stone) discloses the principle of assigning two or more letters/characters to each key of the keyboard and incorporating a modifier key to switch between the letters/characters in a one-handed  
35 layout. According to the Stone Patent, the modifier key for selecting a particular letter is the key having the same background color as the letter to be selected.

United States Patent 4,180,337 (Otey) discloses an arrangement of keys on a keyboard in which each letter of the alphabet is represented by an individual key, with the keys being arranged in five primary rows.

5        United States Patent 3,833,765 (Hilborn et al) teaches a one-handed keyboard and novel logic circuitry associated therewith for permitting data characters to be rapidly entered via a plurality of sequential key  
10        depressions which uniquely define each character. As in the aforementioned Otey Patent, the invention of Hilborn et al includes an alphabetical arrangement of letters.

      United States Patent 4,360,892 (Endfield) teaches a one-handed portable word processor in which the key  
15        arrangements are configured in the shape of letters such that the device uses only six keys which are actuated to create the shapes of letters or characters for composing  
a document.

      United States Patent 4,042,777 (Bequaert et al) teaches a one-handed keyboard with a predetermined  
20        spacial arrangement between the keys for providing combinations to complete a set of alphanumeric characters. To obtain any of the large number of combinations of characters, the user depresses more than one key at a time. The thumb may depress either of four  
25        keys or any two adjacent keys while a finger concurrently presses one key, two keys next to each other or positioned at the intersection of four adjacent keys to press all four at once.

      United States Patent 4,381,501 (Prame) also teaches  
30        a one-handed keyboard using a sequence recording circuit to obtain an increased number of combinations. For instance, if key B is pressed after key A, a different character will be produced then if key A is pressed after key B.

35        All of the above discussed prior art patents disclose the concept of a one-handed keyboard adapted to activate a large number of alphanumeric characters by a

limited number of keys. However, none of the patents disclose or suggest incorporating a standard or traditional keyboard layout such as QWERTY or DVORAK. In fact, the above noted patents teach away from such an incorporation of traditional keyboard layout.

#### Disclosure of the Invention

According to the present invention, an alphanumeric keyboard is provided making possible one-handed touch-typing, while at the same time capitalizing on the wide spread acceptance of and proficiency already attained in the operation of traditional keyboard layouts.

In general, according to the present invention, there is provided a one-handed keyboard, comprising:

- a) a plurality of keys representing one half of a standard keyboard;
- b) means for assigning a pair of characters to each key of said plurality of keys, one of said characters being normally associated with said key and the other said character being associated with the other half of said keyboard;
- c) a modifier key for controlling said means for assigning to switch between said one half and said other half of said keyboard, thereby providing one-handed operation of said keyboard using standard touch-typing techniques.

#### Brief Description of the Drawings

Figure 1 illustrates a standard QWERTY keyboard split roughly in half at the point where left and right hand keys meet;

Figure 2 illustrates a one-handed QWERTY keyboard in accordance with a preferred embodiment of the present invention;

Figure 3 illustrates the right hand field of the keyboard shown in Figure 2;

Figure 4 illustrates the left hand field of the keyboard shown in Figure 2;

Figure 5 illustrates a one-handed left hand QWERTY keyboard in accordance with a first alternative embodiment;

5 Figure 6 illustrates a one-handed left hand DVORAK keyboard in accordance with a second alternative embodiment; and

Figure 7 illustrates a one-handed right hand DVORAK keyboard in accordance with a third alternative embodiment.

10 Best Mode for Carrying out the Invention

Turning to Figure 1, a standard QWERTY keyboard is shown split roughly in half at the point where the left and right hand keys meet. As discussed above, a typist rests his or her fingers of the left hand on A S D F and  
15 the right hand on J K L. Thus, each left hand finger strikes keys on the left hand side of the keyboard which are symmetrically opposite to the keys struck by the corresponding finger of the right hand on the right side of the keyboard. For example, the D key and the K key  
20 are meant to be struck by the middle fingers of the left hand and right hand, respectively.

According to the present invention, it was realized that by assigning two letters or characters to each key, and utilizing a modifier key to switch between each such  
25 letter or character, a one-handed half-keyboard could be provided in which letters of the missing half of the keyboard are arranged to correspond exactly to their original hand pattern except on the other hand. By maintaining the traditional arrangement or layout of keys  
30 of an entire QWERTY keyboard superimposed onto one half, it is believed that a typist will require very little time to gain proficiency on a such a one-handed keyboard, as compared to the above discussed prior art designs.

35 With reference to Figure 2, a preferred embodiment of the one-handed keyboard of the present invention is shown. The keyboard is modelled on standard QWERTY

layout, and adapted for typists who wish to type with their right hand. All letters struck by the same finger of either hand occupy their respective positions relative to the corresponding key in a full sized QWERTY keyboard (e.g. the D key on the left and the K on the right are struck by the same finger).

In operation, by disengaging the  $\leftarrow$  key, (on which a typist's thumbs are intended to rest), the keyboard acts exactly like the right half of a standard keyboard, as illustrated with reference to Figure 3.

However, upon engaging the  $\leftarrow$  key, the keyboard remaps to the pattern shown in Figure 4 corresponding exactly to the pattern of keys on the left side of a QWERTY keyboard relative to the fingers of the left hand.

For example, typing the name "Edgar Matias" would require the following keystrokes:

20	$\leftarrow$ g	$\leftarrow$ d	$\leftarrow$ h	$\leftarrow$ a	$\leftarrow$ r	$\leftarrow$ m	$\leftarrow$ a	$\leftarrow$ t	$\leftarrow$ i	$\leftarrow$ a	$\leftarrow$ s
	E	d	g	a	r	M	a	t	i	a	s

The preferred embodiment of Figure 2 is only one of many possible design layouts in accordance with the present invention. These range from layouts to accommodate left-handed typists, layouts for DVORAK typists, as well as layouts for foreign language alphabets.

In the embodiments shown with reference to Figures 5-7, the  $\leftarrow$  key functions as the modifier key for switching between left and right hand fields of the keyboard layout.

Thus, Figure 5 illustrates a left-hand QWERTY keyboard while Figure 6 represents a left-hand DVORAK.

Likewise, Figure 7 illustrates the layout for a right-handed DVORAK keyboard.

Industrial Applicability

5 The one-handed keyboard of the present invention may be manufactured according to known industrial techniques, and performs the utilitarian function of enabling input of alpha-numeric information using only one hand.

10 In summary, the one-handed keyboard of the present invention benefits from numerous advantages over standard two-handed full-QWERTY layout design. For instance, the keyboard is more compact, being over one third smaller than a full-sized two-handed keyboard. This allows for the design of smaller computers and word processors without sacrificing the ability to touch-type. The  
15 design of the present invention requires only one hand for operation. Thus, the other hand of the typist is left free for hand writing, control of a mouse/joystick, etc. Physically handicapped persons who may only have the use of one hand, are able to touch-type with the  
20 keyboard of the present invention.

Furthermore, the one-handed keyboard of the present invention can actually generate more characters than a standard full-sized keyboard. In particular, the one-handed keyboard of the present invention generates at  
25 least two characters for every key on the keyboard, and twice the number of keys on the present one-handed keyboard exceeds twice the number of keys on one half of the prior art two handed keyboard (see Figures 1 & 2).

Moreover, the one-handed keyboard of the present  
30 invention is horizontally symmetrical. Therefore, there need not be any physical difference between a left and a right hand keyboard, thus allowing concurrent production of left and right hand keyboards without the increase in production costs that is characteristic of prior art  
35 two-handed keyboards having angularly offset keys. This also allows for remapping of the keyboard to



form a numeric keypad (e.g. telephone key pad). In other words, the problem of prior art two-handed keyboards is not present with the one-handed keyboard of the present invention, since the typist's arm does not protrude at an angle. Instead, the typist's arm extends perpendicularly of the keyboard. Therefore, the keys need not be slanted. They may be arranged in a more comfortable and more convenient orthogonal grid pattern.

One major strength of the one-handed keyboard of the present invention is that it does not abandon the traditions of the past, but rather uses them to its advantage. Thus, it is possible with the keyboard of this invention to touch-type with only one hand. This, combined with the advantage of compact size, enables makers of pocket computers to adopt the present design of keyboard for application to word processing markets. Also, as discussed above, a touch-typist can begin typing almost immediately on the one-handed keyboard of the present invention since learning time is reduced to a minimum.

Other embodiments or variations are possible within the sphere and scope of the present invention. For example, the illustrations discussed above deal largely with computer keyboards and software control of keyboard layout and remapping. This, however, need not necessarily be the case. Mechanical, electric and other means of control and remapping can be designed to accommodate the principles of the present invention.

Non-letter symbols on the keyboards of the present invention need not be in the positions (or shapes) shown in Figures 2-7. There is often variation among full-sized traditional keyboard layout designs as to the positions of non-letter symbols. Similar variations can be made to the one-handed keyboard of the present design, without departing from the principles set forth.

Furthermore, it is possible to add more modifier keys for obtaining even more characters. These modifier

keys could be placed in any location (and in whatever shape) that is convenient.

The keys on the one-handed keyboard of the present invention as shown with reference to Figures 2-7 are  
5 arranged in orthogonal grid pattern. For one-handed typing, this layout is thought to be most convenient and most comfortable. However, the keys need not arranged as such. A one-handed keyboard could be arranged with keys disposed at an angle, as with traditional full-sized  
10 keyboards.

The various embodiments of one-handed keyboard illustrated in Figures 2-7 may be electronically implemented by any appropriate means known to those skilled in the art.

15 All such modifications and variations are believed to be within the sphere and scope of the present invention as defined by the claims appended hereto.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE  
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A one-handed keyboard, comprising:
  - 5 a) a plurality of keys representing one half of a standard keyboard;
  - b) means for assigning a pair of characters to each key of said plurality of keys, one of said characters being normally associated with said key and the other  
10 said character being associated with the other half of said keyboard;
  - c) a modifier key for controlling said means for assigning to switch between said one half and said other half of said keyboard, thereby providing one- handed  
15 operation of said keyboard using standard touch- typing techniques.
2. A one-handed keyboard, as defined in claim 1, wherein  
20 said one half and said other half of said standard keyboard are respective halves of a QWERTY keyboard, said one half and said other half being divided by and symmetrical about the following pairs of characters:  
5 and 6; T and Y; G and H; B and N.
- 25 3. A one-handed keyboard, as defined in claim 1 wherein said one half and said other half of said standard keyboard are respective halves of a DVORAK keyboard, said one half and said other half being divided by and symmetrical about the following pairs of said characters:  
30 5 and 6; Y and F; I and D; X and B.
4. A one-handed keyboard as defined in claim 1, 2 or 3, wherein said plurality of keys are arranged in an orthogonal grid.

5. A one-handed keyboard as defined in claim 2, arranged in a right-handed QWERTY configuration, wherein said plurality of keys are disposed in an orthogonal grid.
- 5 6. A one-handed keyboard as defined in claim 2, arranged in a left-handed QWERTY configuration, wherein said plurality of keys are disposed in an orthogonal grid.
7. A one-handed keyboard as defined in claim 3, arranged in a right-handed DVORAK configuration, wherein said plurality of keys are disposed in an orthogonal grid.
- 10 8. A one-handed keyboard as defined in claim 3, arranged in a left-handed DVORAK configuration, wherein said plurality of keys are disposed in an orthogonal grid.
- 15

1/4

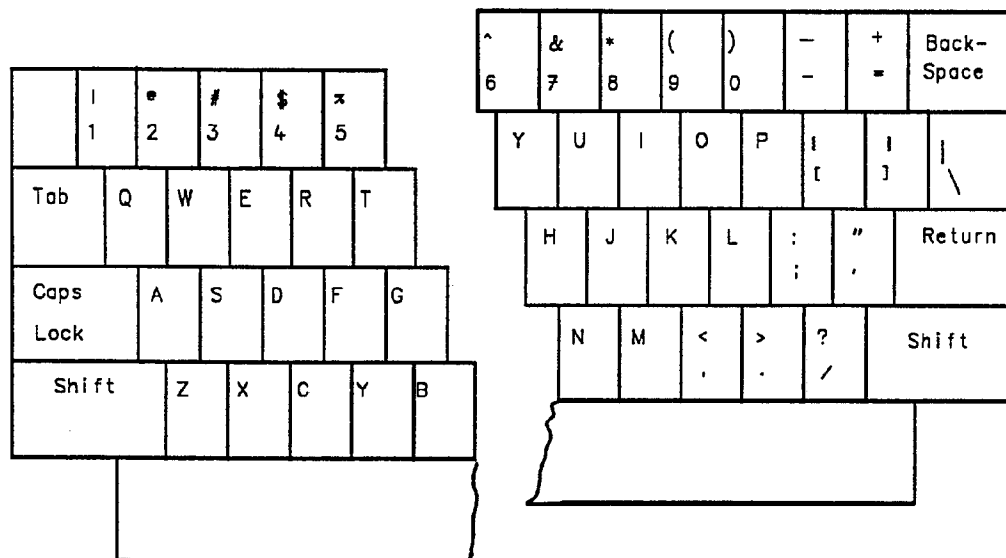


FIG. 1.

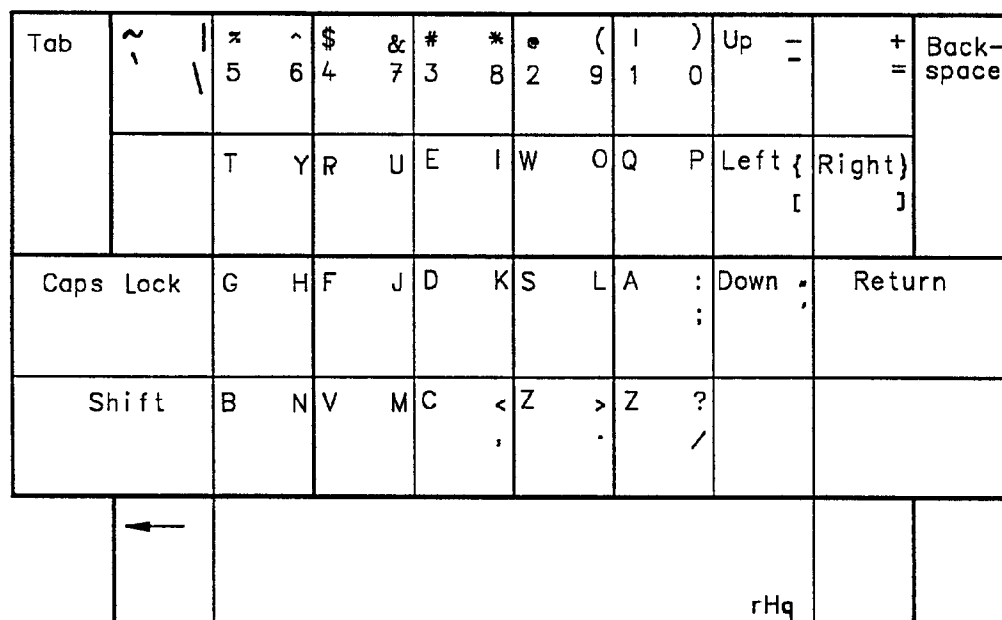


FIG. 2.

2/4

Tab	 \ 	^ 6	& 7	* 8	( 9	) 0	- -	+ =	B.S.
		V	U	I	O	P	{ [	} ]	
Caps Lock		H	J	K	L	:	; ,	Return	
Shift		N	M	< ,	> .	? /			

FIG.3.

Tab	~	z 5	\$ 4	# 3	• 2	! 1	Up		B.S.
		T	R	E	W	Q	Left	Right	
Caps Lock		G	F	D	S	A	Down	Return	
Shift		B	V	C	X	Z			
	←								

FIG.4.

3/4

Back-space	+ =	Up —	I 1	( 0	• 2	) 9	* 3	* 8	\$ 4	& 7	% 5	^ 6	~ ,	 \ 	Tab
	Left { [	Right } ]	Q	P	W	O	E	I	R	U	T	Y			
Return	Down .	A ;	S ;	L	D	K	F	J	G	H	Caps Lock				
		2 / ?	X . <	C , >	V	M	B	N	Shift						
	1Hq												←		

FIG.5.

Back-space	{	Up	}	I	(	e	)	#	*	\$	&	%	^	~		Tab
	[		]	1	0	2	9	3	8	4	7	5	6	,	\	
	Left + =	Right?	/	'	L	<	R	>	,	C	P	G	Y	F		
Return	Down	=		A	S	O	N	E	T	U	H	I	D	Caps Lock		
			:	?	Q	V	J	W	K	M	X	B	Shift			
			:	/												

FIG.6.

4/4

Tab	~ `	 5	^ 6	\$ 4	& 7	# 3	* 8	• 2	( 9	 1	) 0	Up [	{ [	} ]	Back- space
		Y	F	P	G	< ,	> .	R	" ,	L	Left ? /	Right + =			
Caps Lock	I	D	U	H	E	T	O	N	A	S	Down _				Return
Shift	X	B	K	M	D	W	Q	V	:	Z					
	←														
															rHd

FIG. 7.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/CA 90/00274

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>5</sup> : G 06 F 3/023, G 09 B 21/00, B 41 J 5/10		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC <sup>5</sup>	G 06 F, G 09 B, B 41 J, H 01 H, H 03 M	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB, A, 2071578 (IAN ANDREW NOEL LITTERICK) 23 September 1981 see page 3, line 73 - page 4, line 104; figures 1,4	1
A	--	4-6
P,A	US, A, 4911565 (TERRY RYAN) 27 March 1990 see the whole document	1
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
22nd November 1990	18 DEC 1990	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	Mme N. KUIPER	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

CA 9000274  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2071578	23-09-81	EP-A, B 0045307 WO-A- 8102272	10-02-82 20-08-81
US-A- 4911565	27-03-90	None	